



## PATENT COOPERATION TREATY

## PCT

## INTERNATIONAL PRELIMINARY REPORT ON PATENTABILITY

(Chapter II of the Patent Cooperation Treaty)

(PCT Article 36 and Rule 70)

Applicant's or agent's file reference F18509 GSK	<b>FOR FURTHER ACTION</b>		See Form PCT/PEAA16
International application No. PCT/IB2004/003758	International filing date (day/month/year) 17.11.2004	Priority date (day/month/year) 18.11.2003	
International Patent Classification (IPC) or national classification and IPC C07C29/141, C07C45/50, C07C47/02, C07C31/125			
Applicant SASOL TECHNOLOGY(PROPRIETARY) LIMITED			
<p>1. This report is the international preliminary examination report, established by this International Preliminary Examining Authority under Article 35 and transmitted to the applicant according to Article 36.</p> <p>2. This REPORT consists of a total of 6 sheets, including this cover sheet.</p> <p>3. This report is also accompanied by ANNEXES, comprising:</p> <p>a. <input checked="" type="checkbox"/> sent to the applicant and to the International Bureau) a total of 12 sheets, as follows:</p> <p><input checked="" type="checkbox"/> sheets of the description, claims and/or drawings which have been amended and are the basis of this report and/or sheets containing rectifications authorized by this Authority (see Rule 70.16 and Section 607 of the Administrative Instructions).</p> <p><input type="checkbox"/> sheets which supersede earlier sheets, but which this Authority considers contain an amendment that goes beyond the disclosure in the international application as filed, as indicated in item 4 of Box No. I and the Supplemental Box.</p> <p>b. <input type="checkbox"/> (sent to the International Bureau only) a total of (indicate type and number of electronic carrier(s)) , containing a sequence listing and/or tables related thereto, in computer readable form only, as indicated in the Supplemental Box Relating to Sequence Listing (see Section 802 of the Administrative Instructions).</p>			
<p>4. This report contains indications relating to the following items:</p> <p><input checked="" type="checkbox"/> Box No. I Basis of the opinion</p> <p><input type="checkbox"/> Box No. II Priority</p> <p><input type="checkbox"/> Box No. III Non-establishment of opinion with regard to novelty, inventive step and industrial applicability</p> <p><input type="checkbox"/> Box No. IV Lack of unity of invention</p> <p><input checked="" type="checkbox"/> Box No. V Reasoned statement under Article 35(2) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement</p> <p><input type="checkbox"/> Box No. VI Certain documents cited</p> <p><input checked="" type="checkbox"/> Box No. VII Certain defects in the international application</p> <p><input type="checkbox"/> Box No. VIII Certain observations on the international application</p>			
Date of submission of the demand  14.08.2005		Date of completion of this report  07.02.2006	
Name and mailing address of the international preliminary examining authority:  European Patent Office D-80298 Munich Tel. +49 89 2399 - 0 Tx: 523656 epmu d Fax: +49 89 2399 - 4465		Authorized Officer  Osterle, C  Telephone No. +49 89 2399-8120 	

# INTERNATIONAL PRELIMINARY REPORT ON PATENTABILITY

International application No.  
PCT/IB2004/003758

AP2005-20140 17 MAY 2006

## Box No. I Basis of the report

1. With regard to the **language**, this report is based on the international application in the language in which it was filed, unless otherwise indicated under this item.
  - ☐ This report is based on translations from the original language into the following language , which is the language of a translation furnished for the purposes of:
    - ☐ international search (under Rules 12.3 and 23.1(b))
    - ☐ publication of the international application (under Rule 12.4)
    - ☐ international preliminary examination (under Rules 55.2 and/or 55.3)
2. With regard to the **elements\*** of the international application, this report is based on *(replacement sheets which have been furnished to the receiving Office in response to an invitation under Article 14 are referred to in this report as "originally filed" and are not annexed to this report)*:

### Description, Pages

1-20 as originally filed

### Claims, Numbers

1-23 received on 16.09.2005 with letter of 14.09.2005

- ☐ a sequence listing and/or any related table(s) - see Supplemental Box Relating to Sequence Listing
3. ☐ The amendments have resulted in the cancellation of:
    - ☐ the description, pages
    - ☐ the claims, Nos.
    - ☐ the drawings, sheets/figs
    - ☐ the sequence listing (*specify*):
    - ☐ any table(s) related to sequence listing (*specify*):
  4. ☐ This report has been established as if (some of) the amendments annexed to this report and listed below had not been made, since they have been considered to go beyond the disclosure as filed, as indicated in the Supplemental Box (Rule 70.2(c)).
    - ☐ the description, pages
    - ☐ the claims, Nos.
    - ☐ the drawings, sheets/figs
    - ☐ the sequence listing (*specify*):
    - ☐ any table(s) related to sequence listing (*specify*):

\* If item 4 applies, some or all of these sheets may be marked "superseded."

**INTERNATIONAL PRELIMINARY REPORT  
ON PATENTABILITY**

International application No.  
PCT/B2004/003758

**Box No. V Reasoned statement under Article 35(2) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement**

**1. Statement**

Novelty (N)

Yes: Claims 1-23

No: Claims

Inventive step (IS)

Yes: Claims 1-23

No: Claims

Industrial applicability (IA)

Yes: Claims 1-23

No: Claims

**2. Citations and explanations (Rule 70.7):**

**see separate sheet**

**Box No. VII Certain defects in the international application**

The following defects in the form or contents of the international application have been noted:

**see separate sheet**

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**INTERNATIONAL PRELIMINARY  
REPORT ON PATENTABILITY  
(SEPARATE SHEET)**

PCT/IB2004/003758

**Re Item V**

**Reasoned statement with regard to novelty, inventive step or industrial applicability;  
citations and explanations supporting such statement**

- D1: EP-A-0 602 442 (HOECHST AKTIENGESELLSCHAFT) 22 June 1994 (1994-06-22)
- D2: US-B1-6 307 093 (GODWIN ALLEN DAVID ET AL) 23 October 2001 (2001-10-23)
- D3: US-A-5 886 237 (PACKETT ET AL) 23 March 1999 (1999-03-23)
- D4: EP-A-0 529 698 (SHELL INTERNATIONALE RESEARCH MAATSCHAPPIJ B.V) 3 March 1993 (1993-03-03)
- D5: KRANENBURG M ET AL: "NEW DIPHOSPHINE LIGANDS BASED ON HETEROCYCLIC AROMATICS INDUCING VERY HIGH REGIOSELECTIVITY IN RHODIUM-CATALYZED HYDROFORMYLATION: EFFECT OF THE BITE ANGLE" ORGANOMETALLICS, WASHINGTON, DC, US, vol. 14, no. 6, 1 June 1995 (1995-06-01), pages 3081-3089, XP000565303 ISSN: 0276-7333
- D6: CASEY C P ET AL: "DIPHOSPHINES WITH NATURAL BITE ANGLES NEAR 120 DEG INCREASE SELECTIVITY FOR N-ALDEHYDE FORMATION IN RHODIUM-CATALYZED HYDROFORMYLATION" JOURNAL OF THE AMERICAN CHEMICAL SOCIETY, AMERICAN CHEMICAL SOCIETY, WASHINGTON, DC, US, vol. 114, no. 14, 1 July 1992 (1992-07-01), pages 5535-5543, XP000576101 ISSN: 0002-7863

**1. Novelty (Article 33(2) PCT):**

- 1.1 D1, considered the closest prior art discloses the hydroformylation of olefins originating from a Fischer-Tropsch synthesis. In D1 the olefin feedstock reacts with CO and H<sub>2</sub> in the presence of a catalyst system comprising rhodium and a water-soluble salt consisting of a phosphine anion and a tetraorganophosphine cation.

D2 discloses the hydroformylation of olefins using a catalyst system comprising rhodium and a triorganophosphorous ligand. D2 mentions the use of a mixture of monodentate and bidentate phosphorous ligands as a possibility. Feedstock can

originate from a variety of processes of which the Fisher-Tropsch process is mentioned as one of many (see column 2, last paragraph).

D3 and D4 disclose the use of rhodium catalysts comprising bidentate phosphine ligands in the hydroformylation of olefins.

D5 and D6 disclose the use of rhodium catalysts comprising bidentate phosphine as well as monodentate ligands in the hydroformylation of olefins. The olefins used are pure, feedstock originating from a Fischer-Tropsch process is not disclosed.

- 1.2 Claim 1 differs from D1-D4 in that a combination of a monodentate and a bidentate phosphorous ligand is used in the hydroformylation reaction.

Claim 1 differs from D5 and D6 in that the feedstock used originates from a Fischer-Tropsch process.

- 1.3 Present claim 1 as well as dependent claims 2-25 then can be considered novel.

## **2. Inventive Step (Article 33(3) PCT):**

- 2.1 The technical effect linked to the difference between the subject-matter of claim 1 and D1-D6 is that Fischer-Tropsch derived feedstock comprising impurities can be used in the hydroformylation reaction without deactivation of the catalyst system.
- 2.2 The technical problem then can be seen in providing an improved catalyst system which does not suffer from deactivation/loss of activity when used with feedstock derived from a Fischer-Tropsch process.
- 2.3 The solution suggested is to use a catalyst system comprising  $\text{Rh}(\text{acac})(\text{CO})_2$ ,  $\text{Rh}(\text{acac})(\text{CO})(\text{TPP})$ ,  $[\text{Rh}(\text{OAc})_2]_2$ ,  $\text{Rh}_2\text{O}_3$ ,  $\text{Rh}_4(\text{CO})_{12}$ ,  $\text{Rh}_6(\text{CO})_{16}$ ,  $\text{Rh}(\text{CO})_2(\text{dipivaloyl methanoate})$ , or  $\text{Rh}(\text{NO}_3)_2$ .

From the description is evident that rhodium catalysts comprising a variety of combinations of monodentate and bidentate ligands solve the technical problem.

The subject-matter of claim 1 as well as of claims 2-23 thus can be considered inventive.

**3. Industrial Applicability (Article 33(4) PCT):**

The subject-matter of claims 1-25 is considered industrially applicable.

**Re Item VII**

**Certain defects in the international application**

Contrary to the requirements of Rule 5.1(a)(ii) PCT, the relevant background art disclosed in the documents D1 and D5/D6 is not mentioned in the description, nor are these documents identified therein.